A COMMON HUMIDITY ERROR

By W. J. HUMPHREYS

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Many people who should know better seem to have surprisingly vague if not even confused ideas about humidity, and where there is much smoke there generally is some fire. Those who have to do with the measurement of humidity would insist, if questioned, that they know perfectly well what the terms "absolute humidity" and "relative humidity" properly mean. Perhaps they do; nevertheless many, if they should condescend to answer at all, would say, in substance, that absolute humidity is the mass of water vapor present per unit volume of the air, and relative humidity the ratio of the amount of water vapor present to the amount necessary to saturate the air at the same temperature.

That sounds familiar and orthodox, but it reveals confusion at best, for the air has nothing to do with either absolute humidity, properly defined as the mass of water vapor per unit volume (of space, not air), or relative humidity—the ratio of the mass of water vapor present per unit volume (of space) to that which would saturate a unit volume at the same temperature. Be certain not to add "and same pressure," which we sometimes hear, for that refers to the atmosphere, which, as just stated, has nothing to do with the phenomenon in question.

There is, however, one very useful humidity concept that does involve the air, namely, the mass of water vapor per unit mass of humid air. This is called "specific humidity."

But entirely apart from definitions we often see and hear expressions about the air taking up water vapor and about the great avidity of warm air for water vapor. Now, as a matter of fact, the air does not "take up" water vapor—it is not a sponge; and warm air has no avidity, chemical or other kind, for water vapor. All the air does in this connection is to slow down the rate of evaporation and diffusion. It is not the air but the space, air or no air substantially alike (a shade better without the air), that has the vapor capacity. Neither is it the temperature of the air but the temperature of the vapor (again air or no air) that determines the amount of water vapor per unit volume necessary to produce saturation.

Most of us say the air takes up water vapor. Let us forget it, if we can, and say space instead, as that is what we mean, if we understand the phenomenon aright.

TEMPERATURES IN THE HIGHER LAYERS OF THE STRATOSPHERE OVER LINDENBERG

By J. REGER

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In making this study of temperatures in the stratosphere the author has chosen a total of 123 sounding-balloon flights, 81 of which were made in the last four years and the remainder in earlier years. No flights in which the clock stopped prematurely, or which failed to reach a height of at least 17 kilometers, were used in the study, and since temperatures in only the upper levels were to be considered, the 14-kilometer altitude was chosen as the starting point.

Two tables of observed data were compiled and summarized. Some of the more interesting points brought out are as follows:

(1) The yearly means indicate an almost constant temperature from 14 to 16 kilometers and thereafter a slow increase, the mean values at 20 kilometers being 1.43° C. higher than at 14 kilometers.

(2) In winter there appears to be a mean decrease of 2.57° C. from 14 to 20 kilometers.

(3) In summer the mean values indicate the temperature at 20 kilometers to be 4.27° C. higher than at 14 kilometers.

(4) The means of seven flights made in summer and autumn near or after sunset give temperatures at 20 kilometers 1.04° C. lower than those at 14 kilometers.

(5) The means of 10 summer flights made near midday show an increase of 5.01° C. from 14 to 20 kilometers.

Points (2) and (3) would seem to indicate a seasonal variation in temperature between 14 and 20 kilometers. However, the author brings out the fact that the starting time for the greater part of the flights was about 8 a. m., and since there is considerable seasonal difference in the altitude of the sun at this time, the increase may be due to insolation effect. He thinks this theory is supported by points (4) and (5), which indicate a diurnal variation of about 6° C. between noon and evening at 20 kilometers, while the mean temperatures at 14 kilometers differed very little. It is his opinion that there is probably no diurnal variation at 20 kilometers and that therefore most of the increase in temperature from 14 to 20 kilometers must be due to insolation effect.

Therefore, the conclusion is reached that sounding-balloon flights should be made during a lower sun if possible. If this were done, reliable observational data would eventually be collected for great heights where the ventilation, measured in terms of air density × vertical speed of ascent, is small. It is obviously important that the insolation effect be negligible where the ventilation is poor.

Remarks by abstracter.—The investigation of ventilation and insolation effects on indicated temperatures in the higher levels is very important, as all temperature records in the stratosphere are open to question when considered in this light. In the determination of ventilation effect on the temperature element the importance of testing under reduced pressure should not be overlooked, since the ventilation at small air densities must be poor even with a rate of ascent which would be favorable in the lower levels. If it is found impracticable or impossible to maintain sufficient ventilation in the upper levels by increasing the rate of ascent, it may be necessary to make all sounding-balloon flights after sunset, as suggested by Mr. Reger. Even under these circumstances it may be found necessary to compute by an empirical formula the true temperature from the indicated temperature, rate of ascent, and air density.—*J. C. Ballard.*

RUBENSTEIN'S CLIMATIC ATLAS OF THE U. S. S. R.

Reviewed by C. F. BROOKS

The temperature section, Part I, Section I, of Eugenie Rubinstein's atlas of the climate of U. S. S. R.,[1] includes detailed monthly and annual maps of sea-level temperatures; mean annual range; the progress of the mean isotherms of −5°, 0°, 5°, 10°, and 15° C. in spring and fall by 10-day intervals; the number of days in the year with daily mean temperature over −5°, 0°, 5°, 10°, 15°; differences of the successive monthly means of temperature; and two plates including graphs of the monthly course of temperature at 28 stations.

[1] Eugenie Rubinstein, Klima der Union der Sozialistischen Sowjet-Republiken. Teil I. Die Lufttemperatur. Lieferung I. Monatsmittel der Lufttemperatur im Europäischen Teil der U. S. S. R., Geophysikalisches Zentral-Observatorium, Leningrad, 1927, 45 maps and diagrams, 40 by 52 cm.